

# PATENT ABSTRACTS OF JAPAN

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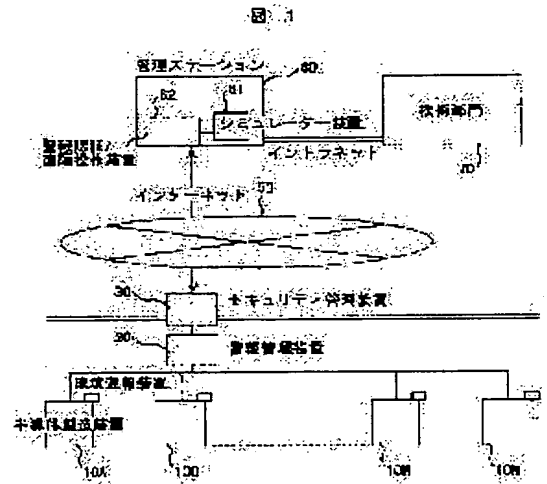
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## (54) SEMICONDUCTOR MANUFACTURING EQUIPMENT MANAGING SYSTEM

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To enable an adequate and quick countermeasure action to be taken as if an engineer familiar with equipment is beside the equipment.

**SOLUTION:** In a method for managing the state of a plurality of semiconductor manufacturing equipment from a remote place, data of the equipment during a normal operation are sampled. On the basis of a group of the sampled data, a range of dispersion of data in the equipment is grasped. In the state of a mutual consent, data during a real operation are monitored in a remote managing station via a communication network in a state that an adequate security management (security managing equipment) is performed. In the course of monitoring, a comparison with the data group is performed, and error generation is warned. When the error generation is recognized, the consent of the semiconductor manufacturing equipment manager is obtained (in order to ensure safety by using environment informing equipment). In order to improve the precision of the information, an access is performed via the communication network from the managing station. (By using alarm verification/remote operation equipment), the semiconductor manufacturing equipment is made to directly perform necessary operations, and the data are transmitted to the managing station.



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CLAIMS

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[Claim(s)]

[Claim 1] It is what manages the condition of two or more semiconductor fabrication machines and equipment in the location which carried out remoteness. Sample the data at the time of normal actuation of said semiconductor fabrication machines and equipment, and based on the sampled data group in the condition of having grasped the range of dispersion in the data in the equipment concerned, and having consented mutually. Acting as the monitor of the data at the time of real operation at the management station which carried out remoteness through the communication network in the condition that the proper security management (security management equipment) was made. After it announced error generating beforehand or it has recognized error generating, and obtaining consent of the semiconductor manufacture device-management person concerned in the condition before performing the comparison with a data group and detecting an error (in order to secure insurance using environmental report equipment). In order to raise the precision of the information, it accesses through a communication network from a management station. The managerial system for the semiconductor fabrication machines and equipment which are made to carry out necessary actuation to the semiconductor fabrication machines and equipment concerned directly (using alarm authentication / remote control), and are characterized by transmitting the data to a management station.

[Claim 2] It is what manages the condition of two or more semiconductor manufacture manufacturing installations in the location which carried out remoteness. At the management station which sampled the data at the time of normal actuation of said semiconductor fabrication machines and equipment, has grasped the range of dispersion in the data in the equipment concerned based on the sampled data group, and carried out remoteness of the data at the time of real operation. In the condition before performing the comparison with a data group and detecting an error, acting as a monitor through the communication network in the condition that the proper security management was made. Are those who predict error generating or recognize error generating, and each monitor element is received. The data value which had 3 values of the set point, a control value, and threshold value about the recipe setup, and were collected by the monitor at the time of real operation. Before deciding the allowed value of the frequency exceeding a control value and reaching threshold value, an error generating preliminary announcement is sent. When threshold value is exceeded, after sending error generating, receiving it at a management station and obtaining consent of the semiconductor device manager concerned. In order to raise the precision of the information, it accesses through a communication network from a management station. The managerial system for the semiconductor fabrication machines and equipment which are made to carry out necessary actuation to the semiconductor fabrication machines and equipment concerned directly, and are characterized by making the data transmit to a management station, and enabling it to take out proper directions to a proper device-management person.

[Claim 3] In the managerial system for semiconductor fabrication machines and equipment according to claim 2, in the condition before an error is detected. After announcing error generating beforehand, or having recognized error generating and obtaining consent of the semiconductor manufacture device-management person concerned. In order to raise the precision of \*\*\*\*\*, it accesses through a communication network from a management station. While carrying out necessary actuation to the semiconductor device concerned directly, transmitting the data to a management station and enabling it to take out proper directions to a proper device-management person. The managerial system for the semiconductor fabrication machines and equipment characterized by only for the equipment whole region concerned and an applicable part establishing the phase about the actuation concerned, and acquiring consent of the semiconductor manufacture device-management person concerned.

[Claim 4] The managerial system for the semiconductor fabrication machines and equipment with which at least one camera which can photo equipment and the circumference to the semiconductor-fabrication-machines-and-equipment side concerned is installed in the managerial system for semiconductor fabrication machines and equipment according to claim 1 to 3, and the image photoed with the camera is characterized by making it the configuration which can receive a picture on real time at a management station.

[Claim 5]. In the managerial system for semiconductor fabrication machines and equipment according to claim 1 to 4 The error preliminary announcement of the equipment concerned which stationed the simulator for the semiconductor fabrication machines and equipment concerned at the management station, and has been sent Or the log data before an error is inputted into this simulator. The managerial system for the semiconductor fabrication machines and equipment characterized by generating in simulation the conditions which are the same as log data, or a near condition generates, grasping more the situation of the semiconductor device concerned in a remote place to accuracy, and sending workmanship instruction to the engineer who is there.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is the location which isolated in distance the semiconductor fabrication machines and equipment by which distributed installation was carried out to every place with the location in which these semiconductor fabrication machines and equipment are installed, and relates to the semi-conductor manufacture device-management system managed intensively.

[0002]

[Description of the Prior Art] Conventionally, the engineer stood face to face against the equipment concerned, and checked a sound, temperature, vibration, etc. directly or indirectly, or it was made to run by the test pattern at semiconductor fabrication machines and equipment, they looked at the data, and judged normal and abnormalities. they are those who are called the service member which belongs to the firm side which was affiliation of the firm of engineering which the engineer also has the case of the personnel of the firm which owns the equipment concerned, and contracted with said firm, or manufactured this equipment -- etc. -- it is various.

[0003] Much, based on experience of these men, the cure and the maintenance are made to each phenomenon.

[0004]

[Problem(s) to be Solved by the Invention] Detailed-izing of the semi-conductor to produce and productivity progress quickly, and it comes to continue very intricately variably [ the problem generated in the semiconductor fabrication machines and equipment for corresponding to this ], and is becoming however, less enough [ just correspondence at a spot ] as.

[0005] The error was displayed (a problem occurring) and the problem in the conventional system was obliged to \* and an equipment halt, so that it could be called most, and it has caused trouble to the production process.

Moreover, the approach generally taken for the cause pursuit which the problem generated asks a manufacturer's expert that the problem occurred and the cause expected by means of communications, such as a telephone, from the engineer who faced the problem. This expert requests to have log data outputted and sent to eye backlash to know the condition of equipment until equipment results in failure in more detail from the log data managerial system with which equipment was equipped. This engineer pulls out the log data specified from his equipment, and sends to this expert. This expert that received analyzes log data, presumes a cause and directs the treatment which should be taken to this engineer.

[0006] Only with the sent log data, when decision is difficult, I request additional actuation from this engineer, have data created, I have the data \*\*\*\*(ed), and analysis is added. Since the procedure is complicated, also when a corroboration is not obtained, the range of presumed will be extended and a cure will be directed.

[0007] Furthermore, before an error occurs, as compared with the case where it is coped with, a loss is economically [ in time and ] large [ all that matters / restoring and starting these semiconductor fabrication machines and equipment that the error occurred in the case of semiconductor fabrication machines and equipment, and once carried out abnormality actuation ] intentionally.

[0008] Although a device management will be the earliest in time when the engineer expert in the equipment is standing by near each equipment for every equipment concerned, it is actually impossible that only the number which produces equipment brings up an engineer. Even if it is able to \*\*\*\*\*, it is economically useless to make the engineer who does no duty in the normal condition usually stand by in an equipment side.

[0009] If the engineer of the purpose of this invention expert in equipment is in an equipment side in view of the above-mentioned trouble, it can take the same action, and it is to be able to be made to perform a proper and prompt action.

[0010]

[Means for Solving the Problem] This invention is the approach of being the location which carried out remoteness and managing the condition of two or more semiconductor fabrication machines and equipment. Sample the data at the time of normal actuation of said semiconductor fabrication machines and equipment, and based on the sampled data group in the condition of having grasped the range of dispersion in the data in the equipment concerned, and having consented mutually Acting as the monitor of the data at the time of real operation at the management station which carried out remoteness through the communication network in the condition that the proper security management (security management equipment) was made After it announced error generating beforehand or it has recognized error generating, and obtaining consent of the semi-conductor manufacture device-management person concerned in the condition before performing the comparison with a data group and detecting an error (in order to secure insurance using environmental report equipment) In order to raise the precision of the information, from a management station, it accesses through a communication network, necessary actuation is directly carried out to the semiconductor fabrication machines and equipment concerned (using alarm authentication / remote control), and it is characterized by transmitting the data to a management station.

[0011] If the engineer expert in equipment is in an equipment side, the same action can be taken, and to the semiconductor fabrication machines and equipment which the engineer who had full knowledge of equipment according to this invention was made to stand by to a management station, supervised two or more semiconductor fabrication machines and equipment to coincidence through the communication network, and have disseminated the information on an error preliminary announcement and an error, it could be made to perform a proper and prompt action in cooperation with the engineer who is there.

[0012] Furthermore, when unsolvable, a technical section and contact are taken with intranet and it can be made to perform adequate decision on real time only in the engineer of a management pin center, large. A technical section means the section in which the engineer of special fields of study, such as a design, manufacture, and inspection, is.

[0013] Although the equipment concerned could also be operated through the engineer of a spot in order that the engineer expert in equipment might get data required for a check, in this invention, it permitted that the engineer expert in the equipment which is present in a remote place took out a command to the equipment concerned, and did desired actuation directly. However, if it is made to operate in this case while the situation of a spot has been unknown, in order for there to be risk of making derivative accident induce and to secure the insurance of a spot, it enabled it to operate it by obtaining a local device-management person's consent.

[0014] Furthermore, a camera is installed in an equipment site and the image is copied on the monitor of a management station, and when the engineer expert in equipment who is present in a management station issues directions of equipment of operation, it can make it possible to check the condition of equipment by itself, in order to raise safety.

[0015] It may be inconvenient, and a simulation error is generated using the simulator who annexed to the management station in that case, and operating equipment depending on the situation of an error builds the managerial system of semiconductor fabrication machines and equipment which can perform suitable treatment quickly by having enabled it to fully grasp according to the situation of the fault of the semiconductor fabrication machines and equipment concerned, even if the condition of equipment is in a remote place.

[0016]

[Embodiment of the Invention] Hereafter, drawing explains the example of this invention to a detail.

[0017] Drawing 1 is drawing showing the semi-conductor manufacture device-management structure of a system which becomes this invention 1 example.

[0018] This system is periodical and a thing whose diagnosis is the need and which carries out remote diagnoses suitably by the way using the diagnostic equipment in which B company which is that manufacture manufacturer or a service firm in some semiconductor fabrication machines and equipment of A company contains simulator equipment.

[0019] In this remote diagnostic system, the semiconductor fabrication machines and equipment 10 (10A-10N) of A company set as troubleshooting or the object of renewal of data are connected to the semi-conductor manufacture device control server 20 of A company. A server 20 minds internet server 40 and is connected to the Internet 50. It connects with the diagnostic equipment 60 which equipped the Internet 50 with the diagnostic program of semiconductor fabrication machines and equipment through the internet server of B company. It connects with the computer system 70 of the technical section which supports diagnostic equipment 60 through

tranet to diagnostic equipment 60.

0020] In addition, the general telephone line and the general communication line of dedication, the communication line by the optical cable, etc. are used for connection between semiconductor fabrication machines and equipment, each server, the Internet, and diagnostic equipment. Moreover, it cannot be overemphasized that an IP address, a specific ID number, etc. are beforehand given for every device for the communication link between Customer A and the equipment manufacturer B.

0021] The semi-conductor manufacture device control server 20 (and server of B company) is constituted by the computer, and control units and displays, such as a keyboard and a mouse, are connected as an I/O means. A server 20 accesses the Internet and has a browser (WWW browser) for connecting with the server of B company. Moreover, each semiconductor fabrication machines and equipment 10 (10A-10N) are also equipped with the personal computer, respectively, and control units and displays, such as a keyboard as an I/O means and a mouse, are connected.

0022] Each computer of server 20 grade is equipped with the interface for connecting with an external device, and the communication link of data or a command performed between the microcomputer in each computer and an external device is performed through this interface. Furthermore, it has the communication link interface and the modulation of data or a command and transmission which the microcomputer created, reception of the data and the command which are sent through the telephone line etc., and a recovery are performed.

0023] Drawing 2 is drawing showing the semi-conductor manufacture device control server's 20 example of a configuration in the system of drawing 1. The semi-conductor manufacture device control server 20 is constituted by the personal computer, and control units, such as a keyboard and a mouse, and a display are connected as an I/O means 21. Moreover, it has the interface 22 for external connection and the communication link interface 23 for connecting with an external device. Furthermore, a server 40 is understood, the Internet 50 is accessed and the browser (WWW browser) 25 for connecting with a server 60 is held at the storage means with which the internal microcomputer 24 is equipped. Furthermore, the database 28 which recorded a program 26 and the various simulation programs 27 required to control semiconductor fabrication machines and equipment 10 (10A-10N), and manufacture a semi-conductor, the data for a diagnosis, and the schedule and diagnostic result of a diagnosis, and the database 29 of the information on various simulation relation are formed.

0024] The example of a control configuration of the semiconductor fabrication machines and equipment 10 (10A-10N) in the system of drawing 1 is shown in drawing 3. 212 is a CC means to control the whole, for example, is CPU. 213 is operational status, the contents of a setting of a service condition, and a display means that displays initiation directions / termination of operation, for example, is CRT. 214 is an input means and is perform a setup of a service condition, the initiation directions input of operation, process processing conditions, maintenance, the actuation input of a maintenance etc., for example, ] a keyboard. 215 — a device control means — it is — operation of the above-mentioned process processor 2-1 to 2-4 — the operation information signal condition which shows that it is effective/invalid is judged, even if it becomes impossible during unattended operation to operate one of the process processors 202-1 to 202-4, this process processor is not used, but the procedure which carries out operation continuation using other process processors is memorized. For example, it is ROM. 216 is a processing sequence information storage means to memorize the processing sequence of the wafer within a vacuum processor, for example, is RAM. The data into which the processing sequence of this wafer was inputted by the operator using the display means 213 and the input means 214 before the start up are memorized. 217 — an operation information signal storage means — it is — operation of the process processor 202-1 to 202-3 — memorize the operation information signal which shows that it is effective/invalid, for example, it is RAM. 202-1 to 202-3 is a process processor which performs process processing of a wafer. You may be anything as long as it is the processing which performs process processings of a wafer, such as etching, after treatment, membrane formation, a spatter, CVD, and water treatment, as this processor.

0025] 201-1 to 201-3 — operation of the process processor 202-1 to 202-3 — it is an operation information signal generating means to generate the operation information signal which shows that it is effective/invalid. In this example, although prepared in the process processor, you may be anywhere. Either of the degrees can be used as a means to generate this operation information signal.

0026] 1) The cutoff signal of the equipment power source of a process processor  
2) The operation change signal which sets up effective/invalid of use of a process processor (for example, changeover switch)

3) Input in which the operator did the setting input as an operation control signal which shows effective/invalid of use of a process processor [0027] Next, drawing 4 shows the example of the vacuum processor adopted as a process processor 202-1 to 202-4 of drawing 3. First, in drawing 6 (A), 201 is a conveyance processor which performs wafer conveyance, and conveys the wafer of a load lock chamber to the process processor 202-1 to 202-4 according to a wafer conveyance schedule. Moreover, the wafer which carried out processing termination with the process processor is conveyed to the following process processor, and the wafer which all process processings ended is conveyed to an unload lock chamber. 202-1 to 202-4 is a process processor which performs process processing. As process processing, all process processings of a wafer, such as etching, after treatment, membrane formation, a spatter, CVD, and rinsing processing, are included. \*\* which carries in to a conveyance processor the wafer as for which 203 is a load lock chamber, and which is in the atmospheric-air transport device 206, \*\* which takes out the wafer as for which 204 is an unload lock chamber, and which is in a vacuum processing room to the atmospheric-air transport device 206, The vacuum robot which 205 is installed in a conveyance processor and conveys a wafer, An atmospheric-air transport device for 206 to install the cassette which contained the wafer, and 207 are the cassettes which contained the wafer to process, and are the cassette which contained the wafer for products, and the cassette which contained the wafer for cleaning. The atmospheric-air robot which 208 takes out the wafer in the cassette on an atmospheric-air transport device from a cassette, and carries it in to a load lock chamber 203, and returns the wafer of the unload lock chamber 204 to the original cassette is shown.

[0028] The following can be considered as an object of the equipment simulation by this invention.

[0029] (1) The step gap stepping motor of each stepping motor is used as each next driving source of a process processor. A cassette loader, the robot of the atmospheric-air transport device 206, the gate valve of a load lock chamber 203 or the unload lock chamber 204, the vacuum robot 205, and gate valve (2) each vacuum pump between a buffer room and a vacuum processing room are used as each next source of a vacuum of a process processor. The load lock chamber 203, the unload lock chamber 204 and a buffer room, and the vacuum processing room (3) flow-control-valve flow control valve are used in the next part of a process processor.

A process gas flow control valve, a cooling water flow control valve, a heat transfer quantity-of-gas-flow control valve [0030] Next, a processing flow in case an equipment manufacturer performs a simulation diagnosis of a customer's semiconductor fabrication machines and equipment is explained. A simulation diagnosis has a periodic diagnosis and the irregular diagnosis at the time of error generating.

[0031] In a periodic diagnosis, Customer A transmits periodic-diagnosis data for condition data to the equipment manufacturer B via a server and the Internet, and the data is held at the equipment manufacturer's B periodic-diagnosis database. On the other hand, at the time of error generating, the diagnostic demand which specified the event of an error in forms, such as error No., is sent to the equipment manufacturer B from Customer A via the Internet. About the stage of a periodic diagnosis, Customer A may be beforehand contacted from the equipment manufacturer B.

[0032] If there is a commuter's ticket or an irregular diagnostic demand from Customer A, the equipment manufacturer's B diagnostic equipment will start the diagnostic program, and will start remote diagnoses to Customer's A semiconductor fabrication machines and equipment.

[0033] It is as follows when the mode of a simulation diagnosis of this invention is shown.

[0034] It is the approach of managing the condition of two or more semiconductor fabrication machines and equipment in this invention in the location which carried out remoteness. Sample the data at the time of normal actuation of said semiconductor fabrication machines and equipment, and based on the sampled data group in the condition of having grasped the range of dispersion in the data in the equipment concerned, and having consented mutually Acting as the monitor of the data at the time of real operation at the management station which carried out remoteness through the communication network in the condition that the proper security management (security management equipment) was made In the condition before performing the comparison with a data group and detecting an error, error generating is announced beforehand or error generating is recognized.

[0035] Thereby, in order to raise the precision of the information, it accesses through a communication network, necessary actuation is directly carried out to the semiconductor fabrication machines and equipment concerned using alarm authentication / remote control), and the data is made to transmit to a management station from a management station, after obtaining a semi-conductor manufacture device-management person's consent (in order to secure insurance using environmental report equipment).



[0036] And it enables it to issue directions with the engineer proper to a proper device-management person who is in a management station.

[0037] In this invention, the simulator for the semiconductor fabrication machines and equipment concerned is stationed at the management station 60, it is the same as log data, or the log data the error preliminary announcement of the sent equipment concerned or before an error is inputted into this simulator, and workmanship instruction is sent [ the conditions which a near condition generates are generated in simulation, the situation of the semiconductor device 10 concerned in a remote place is grasped more to accuracy, and ] to the engineer who is there.

[0038] Moreover, in the location which carried out remoteness of the condition of two or more semiconductor manufacture manufacturing installations 10 in this invention, it is the approach of managing, and the data at the time of normal actuation of semiconductor fabrication machines and equipment is sampled, and based on the sampled data group, the range of dispersion in the data in the equipment concerned is grasped, and it acts as a monitor through the communication network 50 in the condition that the proper security management was made at the management station 60 which carried out remoteness of the data at the time of real operation.

[0039] And in the condition before performing the comparison with a data group and detecting an error, error generating is predicted or error generating is recognized.

[0040] Before having 3 values of the set point, a control value, and threshold value about a recipe setup, deciding the allowed value of the frequency where the data value collected by the monitor at the time of real operation exceeds a control line value, to each monitor element and reaching threshold value, an error generating preliminary announcement is sent.

[0041] Drawing 5 is drawing showing the example of the recognition approach of the alarm data in the example of this invention. The control line value of predetermined width of face is focusing on the set point of predetermined width of face, and error signaling Rhine is located on the outside.

[0042] And error generating is sent when threshold value (error signaling Rhine) is exceeded. And after receiving it at a management station and obtaining consent of the semiconductor device manager concerned, in order to raise the precision of the information, from a management station, access through a communication network, carry out necessary actuation to the semiconductor fabrication machines and equipment concerned directly, the data is made to transmit to a management station, and it carries out as [ issue / directions with the engineer proper to a proper device-management person who is in a management station ].

[0043] Moreover, in the location which carried out remoteness of the condition of two or more semiconductor fabrication machines and equipment according to this invention, it is the approach of managing, and the data at the time of normal actuation of said semiconductor fabrication machines and equipment is sampled, and based on the sampled data group, the range of dispersion in the data in the equipment concerned is grasped, and it acts as a monitor through the communication network in the condition that the proper security management was made at the management station which carried out remoteness of the data at the time of real operation.

[0044] And in the condition before performing the comparison with a data group and detecting an error, after announcing error generating beforehand, or having recognized error generating and obtaining consent of the semiconductor manufacture device-management person concerned, in order to raise the precision of the information, from a management station, it accesses through a communication network and necessary actuation is directly carried out to the semiconductor device concerned.

[0045] And the data is made to transmit to a management station, and the engineer who is in a management station gets consent of the semiconductor manufacture device-management person concerned to a proper device-management person in the managerial system for the semiconductor device which enabled it to issue proper directions.

[0046] As for this approach, only the equipment whole region concerned and an applicable part have a phase about the actuation concerned.

[0047] Drawing 6 is drawing showing the semiconductor manufacture device-management system which becomes other examples of this invention. In the location which carried out remoteness of the condition of two or more semiconductor fabrication machines and equipment according to this example, it is the approach of managing, and the data at the time of normal actuation of said semiconductor fabrication machines and equipment is sampled, and based on the sampled data group, the range of dispersion in the data in the equipment concerned is grasped, and it acts as a monitor through the communication network in the condition that the proper security management was made at the management station which carried out remoteness of the data at the time of real operation.

[0048] In and the condition before performing the comparison with a data group and detecting an error After announcing error generating beforehand, or having recognized error generating and obtaining consent of the semi-conductor manufacture device-management person concerned In order to raise the precision of the nformation, it accesses through a communication network from a management station. Carry out necessary actuation, to the semiconductor device concerned directly, the data is made to transmit to a management station, and it enables it to issue directions with the engineer proper to a proper device-management person who is in a management station.

[0049] In this managerial system, at least one camera 40 which can photo equipment and the circumference to the semiconductor-fabrication-machines-and-equipment side concerned was installed, and the image photoed with that camera in the management station made it the configuration which can receive a picture on real time.

[0050]

[Effect of the Invention] According to this invention, if the engineer expert in equipment is in an equipment side, the same action can be taken and a proper and prompt action can be performed.

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TECHNICAL FIELD

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## EFFECT OF THE INVENTION

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## TECHNICAL PROBLEM

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Moreover, the approach generally taken for the cause pursuit which the problem generated asks a manufacturer's expert that the problem occurred and the cause expected by means of communications, such as a telephone, from the engineer who faced the problem. This expert requests to have log data outputted and sent to eye backlash to know the condition of equipment until equipment results in failure in more detail from the log data managerial system with which equipment was equipped. This engineer pulls out the log data specified from his equipment, and sends to this expert. This expert that received analyzes log data, presumes a cause and directs the treatment which should be taken to this engineer.

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## MEANS

[Means for Solving the Problem] This invention is the approach of being the location which carried out remoteness and managing the condition of two or more semiconductor fabrication machines and equipment. Sample the data at the time of normal actuation of said semiconductor fabrication machines and equipment, and based on the sampled data group in the condition of having grasped the range of dispersion in the data in the equipment concerned, and having consented mutually Acting as the monitor of the data at the time of real operation at the management station which carried out remoteness through the communication network in the condition that the proper security management (security management equipment) was made After it announced error generating beforehand or it has recognized error generating, and obtaining consent of the semi-conductor manufacture device-management person concerned in the condition before performing the comparison with a data group and detecting an error (in order to secure insurance using environmental report equipment) In order to raise the precision of the information, from a management station, it accesses through a communication network, necessary actuation is directly carried out to the semiconductor fabrication machines and equipment concerned (using alarm authentication / remote control), and it is characterized by transmitting the data to a management station.

[0011] If the engineer expert in equipment is in an equipment side, the same action can be taken, and to the semiconductor fabrication machines and equipment which the engineer who had full knowledge of equipment according to this invention was made to stand by to a management station, supervised two or more semiconductor fabrication machines and equipment to coincidence through the communication network, and have disseminated the information on an error preliminary announcement and an error, it could be made to perform a proper and prompt action in cooperation with the engineer who is there.

[0012] Furthermore, when unsolvable, a technical section and contact are taken with intranet and it can be made to perform adequate decision on real time only in the engineer of a management pin center, large. A technical section means the section in which the engineer of special fields of study, such as a design, manufacture, and inspection, is.

[0013] Although the equipment concerned could also be operated through the engineer of a spot in order that the engineer expert in equipment might get data required for a check, in this invention, it permitted that the engineer expert in the equipment which is present in a remote place took out a command to the equipment concerned, and did desired actuation directly. However, if it is made to operate in this case while the situation of a spot has been unknown, in order for there to be risk of making derivative accident induce and to secure the insurance of a spot, it enabled it to operate it by obtaining a local device-management person's consent.

[0014] Furthermore, a camera is installed in an equipment site and the image is copied on the monitor of a management station, and when the engineer expert in equipment who is present in a management station issues directions of equipment of operation, it can make it possible to check the condition of equipment by itself, in order to raise safety.

[0015] It may be inconvenient, and a simulation error is generated using the simulator who annexed to the management station in that case, and operating equipment depending on the situation of an error builds the managerial system of semiconductor fabrication machines and equipment which can perform suitable treatment quickly by having enabled it to fully grasp according to the situation of the fault of the semiconductor fabrication machines and equipment concerned, even if the condition of equipment is in a remote place.

[0016]

[Embodiment of the Invention] Hereafter, drawing explains the example of this invention to a detail.

[0017] Drawing 1 is drawing showing the semi-conductor manufacture device-management structure of a

system which becomes this invention. 1 example.

[0018] This system is periodical and a thing whose diagnosis is the need and which carries out remote diagnoses suitably by the way using the diagnostic equipment in which B company which is that manufacture manufacturer or a service firm in some semiconductor fabrication machines and equipment of A company contains simulator equipment.

[0019] In this remote diagnostic system, the semiconductor fabrication machines and equipment 10 (10A-10N) of A company set as troubleshooting or the object of renewal of data are connected to the semi-conductor manufacture device control server 20 of A company. A server 20 minds internet server 40 and is connected to the Internet 50. It connects with the diagnostic equipment 60 which equipped the Internet 50 with the diagnostic program of semiconductor fabrication machines and equipment through the internet server of B company. It connects with the computer system 70 of the technical section which supports diagnostic equipment 60 through intranet to diagnostic equipment 60.

[0020] In addition, the general telephone line and the general communication line of dedication, the communication line by the optical cable, etc. are used for connection between semiconductor fabrication machines and equipment, each server, the Internet, and diagnostic equipment. Moreover, it cannot be overemphasized that an IP address, a specific ID number, etc. are beforehand given for every device for the communication link between Customer A and the equipment manufacturer B.

[0021] The semi-conductor manufacture device control server 20 (and server of B company) is constituted by the computer, and control units and displays, such as a keyboard and a mouse, are connected as an I/O means. A server 20 accesses the Internet and has a browser (WWW browser) for connecting with the server of B company. Moreover, each semiconductor fabrication machines and equipment 10 (10A-10N) are also equipped with the personal computer, respectively, and control units and displays, such as a keyboard as an I/O means and a mouse, are connected.

[0022] Each computer of server 20 grade is equipped with the interface for connecting with an external device, and the communication link of data or a command performed between the microcomputer in each computer and an external device is performed through this interface. Furthermore, it has the communication link interface and the modulation of data or a command and transmission which the microcomputer created, reception of the data and the command which are sent through the telephone line etc., and a recovery are performed.

[0023] Drawing 2 is drawing showing the semi-conductor manufacture device control server's 20 example of a configuration in the system of drawing 1. The semi-conductor manufacture device control server 20 is constituted by the personal computer, and control units, such as a keyboard and a mouse, and a display are connected as an I/O means 21. Moreover, it has the interface 22 for external connection and the communication link interface 23 for connecting with an external device. Furthermore, a server 40 is understood, the Internet 50 is accessed and the browser (WWW browser) 25 for connecting with a server 60 is held at the storage means with which the internal microcomputer 24 is equipped. Furthermore, the database 28 which recorded a program 26 and the various simulation programs 27 required to control semiconductor fabrication machines and equipment 10 (10A-10N), and manufacture a semi-conductor, the data for a diagnosis, and the schedule and diagnostic result of a diagnosis, and the database 29 of the information on various simulation relation are formed.

[0024] The example of a control configuration of the semiconductor fabrication machines and equipment 10 (10A-10N) in the system of drawing 1 is shown in drawing 3. 212 is a CC means to control the whole, for example, is CPU. 213 is operational status, the contents of a setting of a service condition, and a display means that displays initiation directions / termination of operation, for example, is CRT. 214 is an input means and is perform a setup of a service condition, the initiation directions input of operation, process processing conditions, maintenance, the actuation input of a maintenance etc., for example, ] a keyboard. 215 — a device control means — it is — operation of the above-mentioned process processor 2-1 to 2-4 — the operation information signal condition which shows that it is effective/invalid is judged, even if it becomes impossible during unattended operation to operate one of the process processors 202-1 to 202-4, this process processor is not used, but the procedure which carries out operation continuation using other process processors is memorized. For example, it is ROM. 216 is a processing sequence information storage means to memorize the processing sequence of the wafer within a vacuum processor, for example, is RAM. The data into which the processing sequence of this wafer was inputted by the operator using the display means 213 and the input means 214 before the start up are memorized. 217 — an operation information signal storage means — it is — operation of the process processor 202-1 to 202-3 — memorize the operation information signal which shows



that it is effective/invalid, for example, it is RAM. 202-1 to 202-3 is a process processor which performs process processing of a wafer. You may be anything as long as it is the processing which performs process processings of a wafer, such as etching, after treatment, membrane formation, a spatter, CVD, and water treatment, as this processor.

[0025] 201-1 to 201-3 -- operation of the process processor 202-1 to 202-3 -- it is an operation information signal generating means to generate the operation information signal which shows that it is effective/invalid. In this example, although prepared in the process processor, you may be anywhere. Either of the degrees can be used as a means to generate this operation information signal.

[0026] 1) The cutoff signal of the equipment power source of a process processor

2) The operation change signal which sets up effective/invalid of use of a process processor (for example, changeover switch)

3) Input in which the operator did the setting input as an operation control signal which shows effective/invalid of use of a process processor [0027] Next, drawing 4 shows the example of the vacuum processor adopted as a process processor 202-1 to 202-4 of drawing 3. First, in drawing 6 (A), 201 is a conveyance processor which performs wafer conveyance, and conveys the wafer of a load lock chamber to the process processor 202-1 to 202-4 according to a wafer conveyance schedule. Moreover, the wafer which carried out processing termination with the process processor is conveyed to the following process processor, and the wafer which all process processings ended is conveyed to an unload lock chamber. 202-1 to 202-4 is a process processor which performs process processing. As process processing, all process processings of a wafer, such as etching, after treatment, membrane formation, a spatter, CVD, and rinsing processing, are included. \*\* which carries in to a conveyance processor the wafer as for which 203 is a load lock chamber, and which is in the atmospheric-air transport device 206, \*\* which takes out the wafer as for which 204 is an unload lock chamber, and which is in a vacuum processing room to the atmospheric-air transport device 206, The vacuum robot which 205 is installed in a conveyance processor and conveys a wafer, An atmospheric-air transport device for 206 to install the cassette which contained the wafer, and 207 are the cassettes which contained the wafer to process, and are the cassette which contained the wafer for products, and the cassette which contained the wafer for cleaning. The atmospheric-air robot which 208 takes out the wafer in the cassette on an atmospheric-air transport device from a cassette, and carries it in to a load lock chamber 203, and returns the wafer of the unload lock chamber 204 to the original cassette is shown.

[0028] The following can be considered as an object of the equipment simulation by this invention.

[0029] (1) The step gap stepping motor of each stepping motor is used as each next driving source of a process processor. A cassette loader, the robot of the atmospheric-air transport device 206, the gate valve of a load lock chamber 203 or the unload lock chamber 204, the vacuum robot 205, and gate valve (2) each vacuum pump vacuum pump between a buffer room and a vacuum processing room are used as each next source of a vacuum of a process processor. The load lock chamber 203, the unload lock chamber 204 and a buffer room, and the vacuum processing room (3) flow-control-valve flow control valve are used in the next part of a process processor.

A process gas flow control valve, a cooling water flow control valve, a heat transfer quantity-of-gas-flow control valve [0030] Next, a processing flow in case an equipment manufacturer performs a simulation diagnosis of a customer's semiconductor fabrication machines and equipment is explained. A simulation diagnosis has a periodic diagnosis and the irregular diagnosis at the time of error generating.

[0031] In a periodic diagnosis, Customer A transmits periodic-diagnosis data for condition data to the equipment manufacturer B via a server and the Internet, and the data is held at the equipment manufacturer's B periodic-diagnosis database. On the other hand, at the time of error generating, the diagnostic demand which specified the event of an error in forms, such as error No., is sent to the equipment manufacturer B from Customer A via the Internet. About the stage of a periodic diagnosis, Customer A may be beforehand contacted from the equipment manufacturer B.

[0032] If there is a commuter's ticket or an irregular diagnostic demand from Customer A, the equipment manufacturer's B diagnostic equipment will start the diagnostic program, and will start remote diagnoses to Customer's A semiconductor fabrication machines and equipment.

[0033] It is as follows when the mode of a simulation diagnosis of this invention is shown.

[0034] It is the approach of managing the condition of two or more semiconductor fabrication machines and equipment in this invention in the location which carried out remoteness. Sample the data at the time of normal actuation of said semiconductor fabrication machines and equipment, and based on the sampled data group in

the condition of having grasped the range of dispersion in the data in the equipment concerned, and having consented mutually Acting as the monitor of the data at the time of real operation at the management station which carried out remoteness through the communication network in the condition that the proper security management (security management equipment) was made In the condition before performing the comparison with a data group and detecting an error, error generating is announced beforehand or error generating is recognized.

[0035] Thereby, in order to raise the precision of the information, it accesses through a communication network, necessary actuation is directly carried out to the semiconductor fabrication machines and equipment concerned (using alarm authentication / remote control), and the data is made to transmit to a management station from a management station, after obtaining a semi-conductor manufacture device-management person's consent (in order to secure insurance using environmental report equipment).

[0036] And it enables it to issue directions with the engineer proper to a proper device-management person who is in a management station.

[0037] In this invention, the simulator for the semiconductor fabrication machines and equipment concerned is stationed at the management station 60, it is the same as log data, or the log data the error preliminary announcement of the sent equipment concerned or before an error is inputted into this simulator, and workmanship instruction is sent [ the conditions which a near condition generates are generated in simulation, the situation of the semiconductor device 10 concerned in a remote place is grasped more to accuracy, and ] to the engineer who is there.

[0038] Moreover, in the location which carried out remoteness of the condition of two or more semi-conductor manufacture manufacturing installations 10 in this invention, it is the approach of managing, and the data at the time of normal actuation of semiconductor fabrication machines and equipment is sampled, and based on the sampled data group, the range of dispersion in the data in the equipment concerned is grasped, and it acts as a monitor through the communication network 50 in the condition that the proper security management was made at the management station 60 which carried out remoteness of the data at the time of real operation.

[0039] And in the condition before performing the comparison with a data group and detecting an error, error generating is predicted or error generating is recognized.

[0040] Before having 3 values of the set point, a control value, and threshold value about a recipe setup, deciding the allowed value of the frequency where the data value collected by the monitor at the time of real operation exceeds a control line value, to each monitor element and reaching threshold value, an error generating preliminary announcement is sent.

[0041] Drawing 5 is drawing showing the example of the recognition approach of the alarm data in the example of this invention. The control line value of predetermined width of face is focusing on the set point of predetermined width of face, and error signaling Rhine is located on the outside.

[0042] And error generating is sent when threshold value (error signaling Rhine) is exceeded. And after receiving it at a management station and obtaining consent of the semiconductor device manager concerned, in order to raise the precision of the information, from a management station, access through a communication network, carry out necessary actuation to the semiconductor fabrication machines and equipment concerned directly, the data is made to transmit to a management station, and it carries out as [ issue / directions with the engineer proper to a proper device-management person who is in a management station ].

[0043] Moreover, in the location which carried out remoteness of the condition of two or more semiconductor fabrication machines and equipment according to this invention, it is the approach of managing, and the data at the time of normal actuation of said semiconductor fabrication machines and equipment is sampled, and based on the sampled data group, the range of dispersion in the data in the equipment concerned is grasped, and it acts as a monitor through the communication network in the condition that the proper security management was made at the management station which carried out remoteness of the data at the time of real operation.

[0044] And in the condition before performing the comparison with a data group and detecting an error, after announcing error generating beforehand, or having recognized error generating and obtaining consent of the semi-conductor manufacture device-management person concerned, in order to raise the precision of the information, from a management station, it accesses through a communication network and necessary actuation is directly carried out to the semiconductor device concerned.

[0045] And the data is made to transmit to a management station, and the engineer who is in a management station gets consent of the semi-conductor manufacture device-management person concerned to a proper device-management person in the managerial system for the semiconductor device which enabled it to issue

proper directions.

[0046] As for this approach, only the equipment whole region concerned and an applicable part have a phase about the actuation concerned.

[0047] Drawing 6 is drawing showing the semi-conductor manufacture device-management system which becomes other examples of this invention. In the location which carried out remoteness of the condition of two or more semiconductor fabrication machines and equipment according to this example, it is the approach of managing, and the data at the time of normal actuation of said semiconductor fabrication machines and equipment is sampled, and based on the sampled data group, the range of dispersion in the data in the equipment concerned is grasped, and it acts as a monitor through the communication network in the condition that the proper security management was made at the management station which carried out remoteness of the data at the time of real operation.

[0048] In and the condition before performing the comparison with a data group and detecting an error After announcing error generating beforehand, or having recognized error generating and obtaining consent of the semi-conductor manufacture device-management person concerned In order to raise the precision of the information, it accesses through a communication network from a management station. Carry out necessary actuation to the semiconductor device concerned directly, the data is made to transmit to a management station, and it enables it to issue directions with the engineer proper to a proper device-management person who is in a management station.

[0049] In this managerial system, at least one camera 40 which can photo equipment and the circumference to the semiconductor-fabrication-machines-and-equipment side concerned was installed, and the image photoed with that camera in the management station made it the configuration which can receive a picture on real time.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the semi-conductor manufacture device-management structure of a system which becomes this invention 1 example.

[Drawing 2] It is drawing showing a semi-conductor manufacture device control server's example of a configuration in the system of drawing 1 .

[Drawing 3] The example of a control configuration of the semiconductor fabrication machines and equipment in the system of drawing 1 is shown in drawing 3 .

[Drawing 4] The example of the vacuum processor adopted as a process processor of drawing 3 is shown.

[Drawing 5] It is drawing showing the example of the recognition approach of the alarm data in the example of this invention.

[Drawing 6] It is drawing showing the semi-conductor manufacture device-management system which becomes other examples of this invention.

[Description of Notations]

10 [ — The Internet, 60 / -- Diagnostic equipment, 70 / — Computer system. ] (10A-10N) — Semiconductor fabrication machines and equipment, 20 — A semi-conductor manufacture device control server, 40 — An internet server, 50

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[Translation done.]

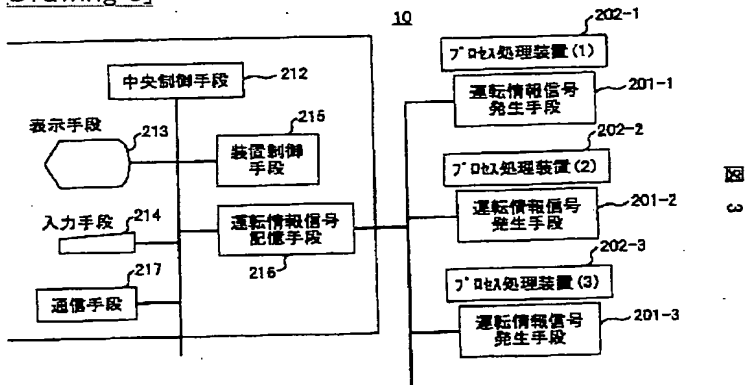
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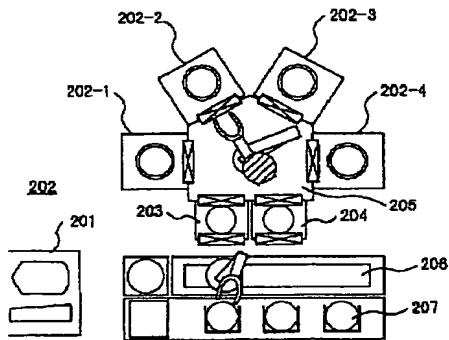
DRAWINGS

Drawing 3]



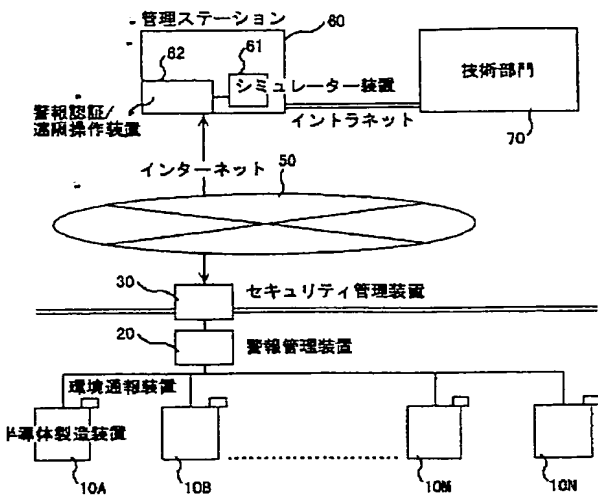
Drawing 4]

図 4



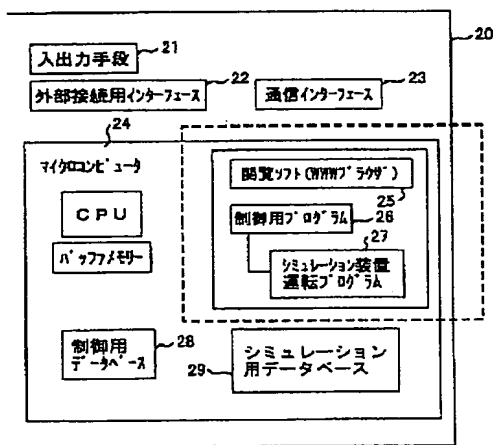
Drawing 1]

図 1



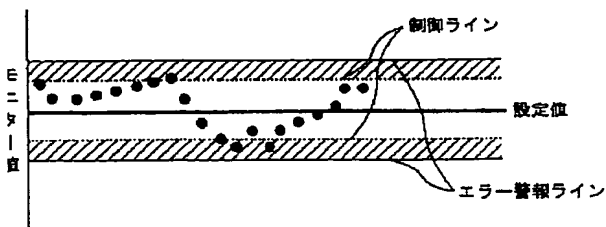
[Drawing 2]

図 2



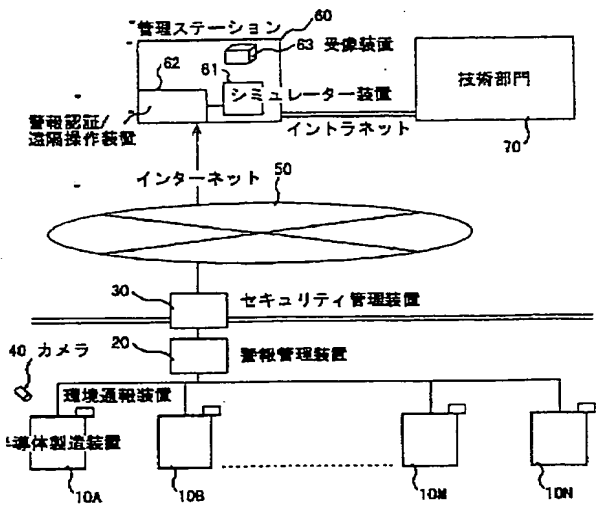
[Drawing 5]

図 5



[Drawing 6]

図 6



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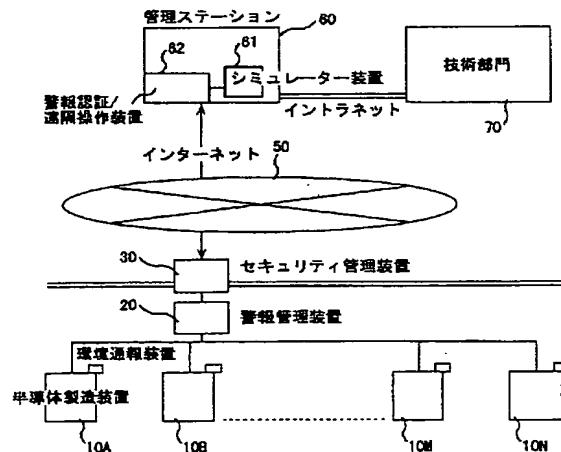
(54) 【発明の名称】 半導体製造装置管理システム

(57) 【要約】

【課題】 あたかも、装置を熟知したエンジニアが装置の側に居ると同じ行動がとれ、適正かつ、迅速な対応ができるようにすることにある。

【解決手段】 複数の半導体製造装置の状態を、遠隔した場所で、管理する方法であって、前記半導体製造装置の正常動作時のデータをサンプリングし、サンプリングされたデータ群に基づいて、当該装置におけるデータのばらつきの範囲を把握し、互いに承諾した状態で、実運転時のデータを遠隔した管理ステーションで、適正なセキュリティ管理（セキュリティ管理装置）がなされた状態の通信ネットワークを介してモニターしながら、データ群との比較を行い、エラーが検出される前の状態で、エラー発生を予告し、あるいはエラー発生を認識して、当該半導体製造装置管理者の承諾（環境通報装置を使用して安全を確保するために）を得た上で、その情報の精度を高めるために、管理ステーションから、通信ネットワークを介してアクセスし、直接当該半導体製造装置に所要の動作をさせて（警報認証/遠隔操作装置を使って）、そのデータを管理ステーションに送信する。

図 1





## 【特許請求の範囲】

【請求項1】複数の半導体製造装置の状態を、遠隔した場所で、管理するものであって、前記半導体製造装置の正常動作時のデーターをサンプリングし、サンプリングされたデーター群に基いて、当該装置におけるデーターのばらつきの範囲を把握し、互いに承諾した状態で、実運転時のデーターを遠隔した管理ステーションで、適正なセキュリティ管理（セキュリティ管理装置）がなされた状態の通信ネットワークを介してモニターしながら、データー群との比較を行い、エラーが検出される前の状態

で、エラー発生を予告し、あるいはエラー発生を認識して、当該半導体製造装置管理者の承諾（環境通報装置を使用して安全を確保するために）を得た上で、その情報の精度を高めるために、管理ステーションから、通信ネットワークを介してアクセスし、直接当該半導体製造装置に所要の動作をさせて（警報認証/遠隔操作装置を使って）、そのデーターを管理ステーションに送信することを特徴とする半導体製造装置のための管理システム。

【請求項2】複数の半導体製造装置の状態を、遠隔した場所で、管理するものであって、前記半導体製造装置の正常動作時のデーターをサンプリングし、サンプリングされたデーター群に基いて、当該装置におけるデーターのばらつきの範囲を把握し、実運転時のデーターを遠隔した管理ステーションで、適正なセキュリティ管理がなされた状態の通信ネットワークを介してモニターしながら、データー群との比較を行い、エラーが検出される前の状態

で、エラー発生を予告し、あるいはエラー発生を認識して、当該半導体製造装置管理者の承諾を得た上で、その情報の精度を高めるために、管理ステーションから、通信ネットワークを介してアクセスし、直接当該半導体製造装置に所要の動作をさせて、そのデーターを管理ステーションに送信し、適正な装置管理者に、適正な指示が出せるようにしたことを特徴とする半導体製造装置のための管理システム。

ーションに送信し、適正な装置管理者に適正な指示が出せるようにするとともに、当該半導体製造装置管理者の承諾を、当該装置全域、該当部位のみ、当該動作についての、段階を設けて取得するようにしたことを特徴とする半導体製造装置のための管理システム。

【請求項4】請求項1乃至3のいずれかに記載の半導体製造装置のための管理システムにおいて、当該半導体製造装置側に装置及び周辺が撮影できるカメラを少なくとも一台設置し、管理ステーションには、そのカメラで撮影した画像が、リアルタイムで受像できる構成にしたことを特徴とする半導体製造装置のための管理システム。

【請求項5】請求項1乃至請求項4のいずれかに記載の半導体製造装置のための管理システムにおいて、管理ステーションに、当該半導体製造装置用のシミュレーターを配備して、送られてきた当該装置のエラー予告あるいは、エラーのまへの、ログデーターを、該シミュレーターに入力して、ログデーターと同じか、近い状態が発生する条件を、模擬的に発生させて、遠隔地にある当該半導体装置の状況を、より正確に把握して、現地に居るエンジニアに、作業指示を発信することを特徴とする半導体製造装置のための管理システム。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、各所に分散設置された、半導体製造装置を、該半導体製造装置が設置されている場所と、距離的に隔離した場所で、集中的に管理する、半導体製造装置管理システムに関する。

【0002】

【従来の技術】半導体製造装置は、従来は当該装置にエンジニアが対峙して、音や、温度、振動などを直接または、間接的に確認したり、テストパターンでランニングさせ、そのデーターを見て、正常か、異常かを判断していた。そのエンジニアは、当該装置を所有する会社の社員の場合もあるし、前記会社と契約したエンジニアリングの会社の所属であったり、あるいは、該装置を製作した会社側に所属するサービス員と呼ばれる人たちである等、多様である。

【0003】多分に、この人たちの経験に基いて、それぞれの現象に対して、対策や、メンテナンスがなされている。

【0004】

【発明が解決しようとする課題】しかし、生産する半導体の微細化、生産性が急速に進歩し、これに対応するための、半導体製造装置に発生する問題も、非常に複雑多岐に亘るようになり、現地での対応だけでは、十分でなくなっている。

【0005】従来のシステムでの問題は、ほとんどと言って良いほどエラーが表示され（問題が発生し）て、装

置停止を余儀なくされて、生産工程に支障をきたしている。また、問題が発生した原因追求のために、一般に取られる方法は、問題に直面したエンジニアから、メーカーの専門家に電話などの通信手段によって、問題が発生したこと、予想される原因を問合せ。該専門家は、装置が故障にいたるまでの、装置の状態をより詳しく知りたいがために、装置に備えられた、ログデータ管理システムから、ログデータをアウトプットして、送付してもらうように依頼する。該エンジニアは、該装置から指定されたログデータを引出して、該専門家に送付する。受取った該専門家はログデータの解析を行い、原因の推定を行い、取るべき処置を該エンジニアに指示する。

【0006】送付された、ログデータだけで判断が困難なときは、該エンジニアに追加の操作を依頼し、データを作成してもらい、そのデータを追送してもらって解析を加える。その手順が煩雑なために、確証が得られないときも、推定の範囲を広げて、対策を指示することになる。

【0007】更に、問題なのは、半導体製造装置の場合には、エラーが発生して一旦異常動作した該半導体製造装置を復旧し立ち上げるのは、エラーが発生する前に、計画的に、対策する場合と比較すると、時間的にも、経済的にもロスが大きい。

【0008】当該装置毎に、その装置を熟知したエンジニアが、それぞれの装置の近傍に待機していると、装置管理は時間的には一番早いことになるが、装置を生産する数だけ、エンジニアを育てることは、現実的に無理がある。よしんばできたとしても、常日頃、正常な状態では何の役目もしない、エンジニアを装置のそばで待機させておくことは、経済的に無駄である。

【0009】本発明の目的は、上記の問題点を鑑み、あたかも、装置を熟知したエンジニアが装置の側に居ると同じ行動がとれ、適正かつ、迅速な対応ができるようにすることにある。

【0010】

【課題を解決するための手段】本発明は、複数の半導体製造装置の状態を、遠隔した場所で、管理する方法であって、前記半導体製造装置の正常動作時のデータをサンプリングし、サンプリングされたデータ群に基づいて、当該装置におけるデータのばらつきの範囲を把握し、互いに承諾した状態で、実運転時のデータを遠隔した管理ステーションで、適正なセキュリティ管理（セキュリティ管理装置）がなされた状態の通信ネットワークを介してモニターしながら、データ群との比較を行い、エラーが検出される前の状態で、エラー発生を予告し、あるいはエラー発生を認識して、当該半導体製造装置管理者の承諾（環境通報装置を使用して安全を確保するために）を得た上で、その情報の精度を高めるために、管理ステーションから、通信ネットワークを介してアクセスし、直接当該半導体製造装置に所要の動作をさ

せて（警報認証/遠隔操作装置を使って）、そのデータを管理ステーションに送信することを特徴とする。

【0011】本発明によれば、装置を熟知したエンジニアを管理ステーションに待機させて、通信ネットワークを通じて、複数の半導体製造装置を同時に監視し、エラー予告、エラーの情報を、発信してきた、半導体製造装置に対して、現地にいるエンジニアとの連携で、あたかも、装置を熟知したエンジニアが装置の側に居ると同じ行動がとれ、適正かつ、迅速な対応ができるようにした。

【0012】さらに、管理センターのエンジニアだけでは、解決できない場合は、イントラネットにて技術部門と連絡を取り、リアルタイムでの確な判断ができるようにする。技術部門とは、設計、製造、検査などの専門分野の技術者がいる部門を言う。

【0013】装置を熟知したエンジニアが、確認のために必要なデータを得るために、現地のエンジニアを介して、当該装置を動作させることもできるが、本発明では、遠隔地にいる装置を熟知したエンジニアが直接、当該装置に指令を出し、所望の動作をさせることを許可した。但し、この場合、現地の状況が不明なままで動作させると、派生的な事故を誘発させる危険があり、現地の安全を確保するために、現地装置管理者の承諾を得て操作が行えるようにした。

【0014】更に、安全性を高めるために、装置サイトにカメラを設置し、その画像を管理ステーションのモニターに写し、管理ステーションにいる、装置を熟知したエンジニアが、装置の動作指示を出す場合に、自分で装置の状態を、確認できるようにすることもできる。

【0015】エラーの状況によっては、装置を動作させることが、不都合な場合もあり、その場合は、管理ステーションに併設した、シミュレーターを使って、模擬エラーを発生させて、装置の状態が遠隔地にいても十分に把握できるようにした事によって、当該半導体製造装置の不具合の状況に応じて、迅速に、適切な処置ができる、半導体製造装置の管理システムを構築する。

【0016】

【発明の実施の形態】以下、図によって、本発明の実施例を詳細に説明する。

【0017】図1は、本発明一実施例になる半導体製造装置管理システムの構成を示す図である。

【0018】このシステムは、A社の半導体製造装置の一部をその製造メーカー或いはサービス会社であるB社がシミュレーター装置を含む診断装置を用いて、定期的及び診断が必要な時に適宜リモート診断するものである。

【0019】このリモート診断システムでは、故障診断やデータ更新の対象となるA社の半導体製造装置10（10A～10N）が、A社の半導体製造装置制御サーバー20に接続されている。サーバー20は、インターネットサーバー40介してインターネット50に接続さ

れている。インターネット50にはB社のインターネットサーバーを介して半導体製造装置の診断プログラムを備えた診断装置60に接続されている。診断装置60にはイントラネットを介して診断装置60をサポートする技術部門のコンピュータシステム70に接続されている。

【0020】なお、半導体製造装置、各サーバー、インターネット、及び診断装置の間の接続には、一般の電話回線や専用の通信回線、光ケーブルによる通信回線等が用いられる。また、顧客Aと装置メーカーB間の通信のために、予め、各機器毎にIPアドレスや特定のID番号等を付与しておくことは言うまでもない。

【0021】半導体製造装置制御サーバー20（及びB社のサーバー）は、コンピュータにより構成されており、入出力手段としてキーボードやマウス等の操作部やディスプレイが接続されている。サーバー20は、インターネットにアクセスし、B社のサーバーに接続するための閲覧ソフト（WWWブラウザ）を持っている。また、各半導体製造装置10（10A～10N）も、夫々パーソナルコンピュータを備えており、入出力手段としてのキーボードやマウス等の操作部やディスプレイが接続されている。

【0022】サーバー20等の各コンピュータは、外部の機器と接続するためのインターフェースを備えており、各コンピュータ内のマイクロコンピュータと外部の機器との間で行われるデータやコマンドの通信は、このインターフェースを介して行われる。さらに、通信インターフェースを備えており、マイクロコンピュータが作成したデータやコマンドの変調及び送信と、電話回線等を経て送られてくるデータやコマンドの受信及び復調を行う。

【0023】図2は、図1のシステムにおける半導体製造装置制御サーバー20の構成例を示す図である。半導体製造装置制御サーバー20は、例えばパーソナルコンピュータにより構成されており、入出力手段21としてキーボードやマウス等の操作部や、ディスプレイが接続されている。また、外部の機器と接続するための外部接続用インターフェース22や、通信インターフェース23を備えている。さらに、内部のマイクロコンピュータ24が備える記憶手段には、サーバー40を解してインターネット50にアクセスし、サーバー60に接続するための閲覧ソフト（WWWブラウザ）25が保持されている。さらに、半導体製造装置10（10A～10N）を制御して半導体を製造するのに必要なプログラム26や各種シミュレーションプログラム27、診断用データや診断のスケジュール及び診断結果を記録したデータベース28、各種シミュレーション関連の情報のデータベース29が設けられている。

【0024】図1のシステムにおける半導体製造装置10（10A～10N）の制御構成例を図3に示す。21

2は、全体を制御する中央制御手段であり、例えばCPUである。213は、運転状態、運転条件の設定内容、運転の開始指示／終了の表示を行う表示手段であり、例えばCRTである。214は入力手段であり、運転条件の設定、運転の開始指示入力、プロセス処理条件、保守やメンテナンスの操作入力等を行う、例えばキーボードである。215は装置制御手段であり、上記プロセス処理装置2-1～2-4の運転有効／無効であることを示す運転情報信号状態を判断し、自動運転中にプロセス処理装置202-1～202-4のどれかが運転不可となっても該プロセス処理装置を使用せず、他のプロセス処理装置を使って運転続行する処理手順を記憶する。例えばROMである。216は、真空処理装置内でのウエハの処理順序を記憶する処理順序情報記憶手段であり、例えばRAMである。このウエハの処理順序は、運転開始前に表示手段213、入力手段214とを使ってオペレータによって入力されたデータが記憶される。217は運転情報信号記憶手段であり、プロセス処理装置202-1～202-3の運転有効／無効であることを示す運転情報信号を記憶する、例えばRAMである。202-1～202-3は、ウエハのプロセス処理を行うプロセス処理装置である。この処理装置としては、エッチング、後処理、成膜、スパッタ、CVD、水処理等ウエハのプロセス処理を行う処理であれば、何でも良い。

【0025】201-1～201-3は、プロセス処理装置202-1～202-3の運転有効／無効であることを示す運転情報信号を発生する運転情報信号発生手段である。本実施例では、プロセス処理装置に設けているが、どこにあっても良い。この運転情報信号を発生する手段として、次のいずれかを用いることができる。

【0026】1）プロセス処理装置の装置電源の遮断信号

2）プロセス処理装置の使用の有効／無効を設定する運転切り替え信号（例えば、切り替えスイッチ）

3）プロセス処理装置の使用の有効／無効を示す運転制御信号として、オペレータが設定入力した入力情報

【0027】次に、図4により、図3のプロセス処理装置202-1～202-4として採用される真空処理装置の例を示す。まず、図6（A）において、201はウエハ搬送を行う搬送処理装置であり、ロードロック室のウエハをウエハ搬送スケジュールに従ってプロセス処理装置202-1～202-4に搬送する。また、プロセス処理装置で処理終了したウエハを次のプロセス処理装置に搬送し、全てのプロセス処理が終了したウエハをアンロードロック室に搬送する。202-1～202-4はプロセス処理を行うプロセス処理装置である。プロセス処理としてはエッチング、後処理、成膜、スパッタ、CVD、水洗処理等ウエハのプロセス処理全てを含む。203はロードロック室であり大気搬送装置206にあ

るウエハを搬送処理装置に搬入する室、204はアンロードロック室であり真空処理室にあるウエハを大気搬送装置206に搬出する室、205は搬送処理装置内に設置されウエハの搬送を行う真空ロボット、206はウエハを収納したカセットを設置するための大気搬送装置、207は処理するウエハを収納したカセットであり製品用ウエハを収納したカセットやクリーニング用ウエハを収納したカセットである。208は大気搬送装置上のカセット内のウエハをカセットから搬出し、ロードロック室203に搬入し、またアンロードロック室204のウエハを元のカセットに戻す大気ロボットを示す。

【0028】本発明による装置シミュレーションの対象としては、次のようなものが考えられる。

【0029】(1) 各ステッピングモーターのステップずれ

ステッピングモーターは、プロセス処理装置の次の各駆動源として使用されている。カセットローダー、大気搬送装置206のロボット、ロードロック室203やアンロードロック室204のゲート弁、真空ロボット205、パuffa室と真空処理室間のゲート弁

(2) 各真空ポンプ

真空ポンプは、プロセス処理装置の次の各真空源として使用されている。ロードロック室203やアンロードロック室204、パuffa室、真空処理室

(3) 流量制御弁

流量制御弁は、プロセス処理装置の次の箇所で使用されている。

プロセスガス流量制御弁、冷却水流量制御弁、伝熱ガス流量制御弁

【0030】次に、装置メーカーが顧客の半導体製造装置のシミュレーション診断を行う場合の処理フローを説明する。シミュレーション診断は、定期診断とエラー発生時の不定期の診断とがある。

【0031】定期診断に当たっては、顧客Aが状態データをサーバー、インターネット経由で定期診断データを装置メーカーBに転送し、そのデータは装置メーカーBの定期診断データベースに保持される。一方、エラー発生時には、エラーの事象をエラーNo.等の形で特定した診断要求がインターネット経由で顧客Aから装置メーカーBへ送られる。定期診断の時期については、装置メーカーBから顧客Aへ予め連絡しても良い。

【0032】顧客Aから定期或いは不定期の診断要求があると、装置メーカーBの診断装置は、その診断プログラムを起動し、顧客Aの半導体製造装置に対してリモート診断を開始する。

【0033】本発明のシミュレーション診断の態様を示すとつぎのようになる。

【0034】本発明では、複数の半導体製造装置の状態を、遠隔した場所で、管理する方法であって、前記半導体製造装置の正常動作時のデータをサンプリングし、

サンプリングされたデータ群に基いて、当該装置におけるデータのばらつきの範囲を把握し、互いに承諾した状態で、実運転時のデータを遠隔した管理ステーションで、適正なセキュリティ管理(セキュリティ管理装置)がなされた状態の通信ネットワークを介してモニターしながら、データ群との比較を行い、エラーが検出される前の状態で、エラー発生を予告し、あるいはエラー発生を認識する。

【0035】これにより、半導体製造装置管理者の承諾(環境通報装置を使用して安全を確保するために)を得た上で、その情報の精度を高めるために、管理ステーションから、通信ネットワークを介してアクセスし、直接当該半導体製造装置に所要の動作をさせて(警報認証/遠隔操作装置を使って)、そのデータを管理ステーションに送信させる。

【0036】そして、管理ステーションに居るエンジニアが、適正な装置管理者に、適正な指示が出せるようにする。

【0037】本発明では、管理ステーション60に、当該半導体製造装置用のシミュレーターを配備して、送られてきた当該装置のエラー予告あるいは、エラーのまへの、ログデータを、該シミュレーターに入力して、ログデータと同じか、近い状態が発生する条件を、模擬的に発生させて、遠隔地にある当該半導体装置10の状況を、より正確に把握して、現地に居るエンジニアに、作業指示を発信する。

【0038】また、本発明では、複数の半導体製造装置10の状態を、遠隔した場所で、管理する方法であって、半導体製造装置の正常動作時のデータをサンプリングし、サンプリングされたデータ群に基いて、当該装置におけるデータのばらつきの範囲を把握し、実運転時のデータを遠隔した管理ステーション60で、適正なセキュリティ管理がなされた状態の通信ネットワーク50を介してモニターする。

【0039】そして、データ群との比較を行い、エラーが検出される前の状態で、エラー発生を予測し、あるいはエラー発生を認識する。

【0040】各モニター要素に対して、レシビ設定に関して設定値、制御値、限界値の3つ値を持ち、実運転時にモニターで集めたデータ値が、制御ライン値を超える頻度の許容値を決めて、限界値に到達する前に、エラー発生予告を発信する。

【0041】図5は、本発明の実施例における警報データの認識方法の例を示す図である。所定幅の設定値を中心に所定幅の制御ライン値があり、その外側に、エラー警告ラインがある。

【0042】そして、限界値(エラー警告ライン)を超えた場合はエラー発生を発信する。そして、それを管理ステーションで受信した後に、当該半導体装置管理者の承諾を得た上で、その情報の精度を高めるために、管理

ステーションから、通信ネットワークを介してアクセスし、直接当該半導体製造装置に所要の動作をさせて、そのデーターを管理ステーションに送信させ、管理ステーションに居るエンジニアが、適正な装置管理者に、適正な指示が出せるようする。

【0043】また、本発明によれば、複数の半導体製造装置の状態を、遠隔した場所で、管理する方法であって、前記半導体製造装置の正常動作時のデーターをサンプリングし、サンプリングされたデーター群に基いて、当該装置におけるデーターのばらつきの範囲を把握し、実運転時のデーターを遠隔した管理ステーションで、適正なセキュリティ管理がなされた状態の通信ネットワークを介してモニターする。

【0044】そして、データー群との比較を行い、エラーが検出される前の状態で、エラー発生を予告し、あるいはエラー発生を認識して、当該半導体製造装置管理者の承諾を得た上で、その情報の精度を高めるために、管理ステーションから、通信ネットワークを介してアクセスし、直接当該半導体装置に所要の動作をさせる。

【0045】そして、そのデーターを管理ステーションに送信させ、管理ステーションに居るエンジニアが、適正な装置管理者に、適正な指示が出せるようにした半導体装置のための管理システムにおいて、当該半導体製造装置管理者の承諾を得る。

【0046】この方法は、当該装置全域、該当部位のみ、当該動作についての、段階を有する。

【0047】図6は、本発明の他の実施例になる半導体製造装置管理システムを示す図である。この実施例によれば、複数の半導体製造装置の状態を、遠隔した場所で、管理する方法であって、前記半導体製造装置の正常動作時のデーターをサンプリングし、サンプリングされたデーター群に基いて、当該装置におけるデーターのばらつきの範囲を把握し、実運転時のデーターを遠隔した管理ステーションで、適正なセキュリティ管理がなされた状態の通信ネットワークを介してモニターする。

【0048】そして、データー群との比較を行い、エラー

＊が検出される前の状態で、エラー発生を予告し、あるいはエラー発生を認識して、当該半導体製造装置管理者の承諾を得た上で、その情報の精度を高めるために、管理ステーションから、通信ネットワークを介してアクセスし、直接当該半導体装置に所要の動作をさせて、そのデーターを管理ステーションに送信させ、管理ステーションに居るエンジニアが、適正な装置管理者に、適正な指示が出せるようにする。

【0049】この管理システムにおいて、当該半導体製造装置側に装置及び周辺が撮影できるカメラ40を少なくとも一台設置し、管理ステーションには、そのカメラで撮影した画像が、リアルタイムで受像できる構成にした。

【0050】

【発明の効果】本発明によれば、あたかも、装置を熟知したエンジニアが装置の側に居ると同じ行動がとれ、適正かつ、迅速な対応ができるようにすることができる。

【図面の簡単な説明】

【図1】本発明一実施例になる半導体製造装置管理システムの構成を示す図である。

【図2】図1のシステムにおける半導体製造装置制御サーバーの構成例を示す図である。

【図3】図1のシステムにおける半導体製造装置の制御構成例を図3に示す。

【図4】図3のプロセス処理装置として採用される真空処理装置の例を示す。

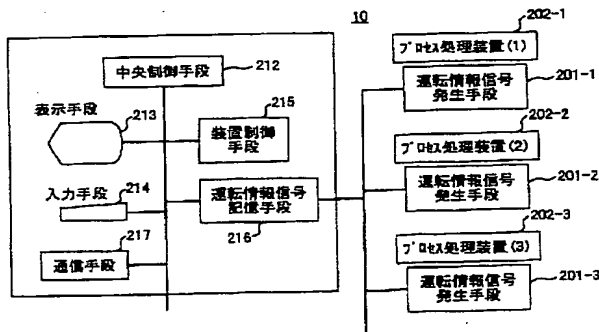
【図5】本発明の実施例における警報データーの認識方法の例を示す図である。

【図6】本発明の他の実施例になる半導体製造装置管理システムを示す図である。

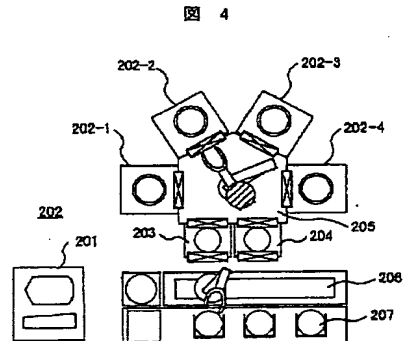
【符号の説明】

10(10A~10N)…半導体製造装置、20…半導体製造装置制御サーバー、40…インターネットサーバー、50…インターネット、60…診断装置、70…コンピュータシステム。

【図3】

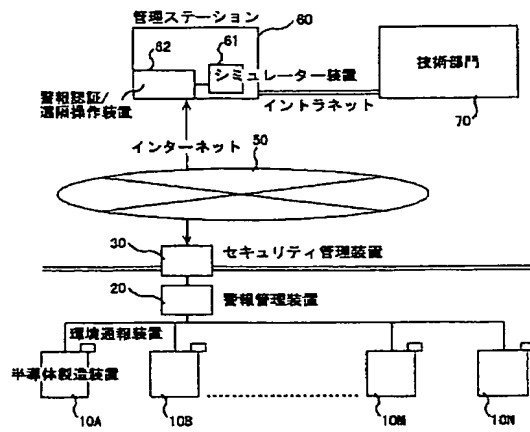


【図4】



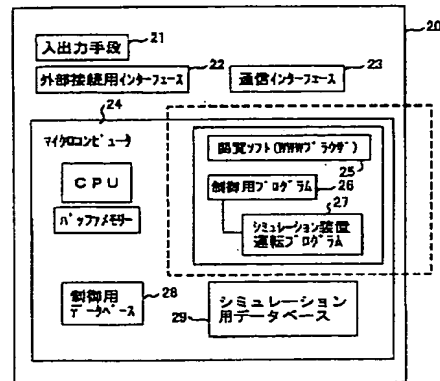
【図1】

図 1



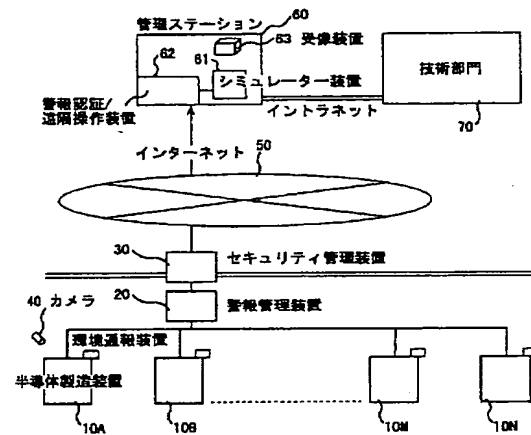
【図2】

図 2



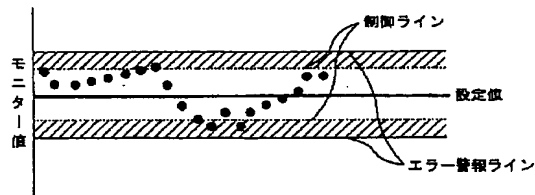
【図6】

図 6



【図5】

図 5



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